Inventions & Innovation Project Abstract

In-Situ, Real Time Measurement of Molten Glass Properties

Energy Research Company (ERCo) plans to develop an instrument that will use Laser Induced Breakdown Spectroscopy (LIBS) to simultaneously measure molten glass elemental concentrations and temperature during glass product fabrication. From this, the glass chemistry and properties are determined in real time and in-situ at any point in the melt. This allows the plant operators to run their melts at tighter tolerances and with fewer defects, leading to improvements in product yield and reductions in energy use and emissions. For the glass industry alone, this could save 27.8 trillion Btu annually. ERCo has previously developed this instrument for use in molten aluminum and glass batch. PPG, the largest fiberglass producer in the US, will assist ERCo to be sure the invention is not just innovative but also useful.

In 1994, the majority of industrial users consumed 22,666 trillion Btu of energy. Of that amount, about 25% (5,200 trillion Btu) was expended in process heating, which is the energy used to raise the temperature of substances involved in the manufacturing process. Examples include melting ingots for die casting operations; annealing steel; melting and processing glass batch to make bottles, flat glass, and specialty glass; and melting scrap aluminum to recycle back into a product, to name a few. In 1999, the glass industry shipped 20 million tons of products worth $28.4 billion and expended 395.3 trillion Btu of energy. The melting and refining steps use 60 to 70% of the total energy. In the US, there are currently 55 container plants, 30 flat glass plants, and about 40 fiberglass plants.

If real-time knowledge of molten glass properties could be available during melting, the forming of the glass product could be held to much tighter tolerances and quality problems could be observed and corrected before the glass was discarded. This would lead to a large reduction in lost product and a commensurate reduction in energy use.

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